

opposition to the views held at the present day, at least in this country. Mr. Harting will have it, as some have done before him, that the swifts and swallows are near akin, and brings forward in support of this contention the views expressed by such undoubted authorities as the late W. K. Parker and Mr. F. A. Lucas. But on the other side we have a still greater weight of authority, greater if only in point of numbers, no less than seven ornithologists, whose names are as household words among us, having emphatically committed themselves to the conviction that the swifts are near allies of the humming-birds. These illustrious seven are Beddard, Furbringer, Gadow, Garrod, Newton, Sharpe and Stejneger. About the finality of their decision there can be little doubt.

Other points in the scheme of classification adopted by Mr. Harting would furnish material for comment did space permit, but these are of comparatively minor importance.

In the matter of nomenclature, Mr. Harting will be accused of unorthodoxy; but in much of what he has done in this matter, and in his defence thereof, he has our sympathy.

Orthography and etymology are conspicuous features of this book, and many of Mr. Harting's observations under these heads are extremely interesting. His scholarly handling of these difficult matters will impress every reader of this work. An immense amount of labour must have been spent in digging in this, to most of us, very uninviting field. But the results undoubtedly are well worth the trouble which has been expended.

The field-notes, as might have been expected from Mr. Harting, are exceedingly interesting. We cannot help thinking that in places these could with advantage have been enlarged upon. The author is one of the favoured few who has watched the bittern in the act of "booming." This remarkable noise is, we now know, produced whilst the beak is pointed vertically upwards, an attitude commonly assumed by this bird. Till recently it was generally held that the "booming" of the bittern was made whilst the beak was thrust down either into the mud or water.

The "drumming" or "bleating" of the snipe naturally calls forth some comment from the author. Opinions differ still as to the mechanism by which this is produced. The author is confident that it derives its origin from the vibration of the primaries. Meeves, it will be remembered, contended that it owed its origin to the vibration of the outer tail feathers, which have peculiarly thickened shafts. Still later observers have tried to show that it is due to the operation of both wings and tail, a violent current of air being driven through the tail feathers by the rapid vibration of the wings.

The introduction of coloured plates constitutes a new feature in this handbook.

"They have been executed in response to a repeated demand for a book on British birds with accurately coloured plates *in one volume*."

This, it is contended, it has been possible to do by figuring the head, and sometimes the foot, only. But this demand was surely for a book giving more or less lengthy diagnostic characters, *supplemented* by coloured

plates. Mr. Harting's book does exactly the reverse, for his diagnoses, which are rare, are supplementary to the plates. No one would, of course, object to this if the plates completely fulfilled their purpose. This they fail to do, inasmuch as several undoubted British birds are not figured at all. Even if the missing heads were added, the book would still be lacking, for more immature stages are necessary, and some heads must be re-drawn, being quite inaccurate. These latter, however, are very few in number.

There are thirty-five plates in all, stated in the title-page to be "from the original drawings by the late Prof. Schlegel." Only a few of these, however, are by Schlegel, the majority having been drawn by Keulemans many years ago, and some are copied from Wolf. Their arrangement must have been entrusted to a foolish person, for a more stupid, exasperating distribution would have been impossible. Instead of being placed at the end of the book, they are distributed between every ten pages of so. Thus the plate illustrating the buntings faces the text dealing with the sand grouse and capercallie, that containing the finches is intercalated between the text devoted to the pheasant, the small wading birds faces the description of the wild-duck, and so on!

But these are minor blemishes in a work of considerable value, blemishes easily remedied in a second edition which is almost sure to be demanded. The binding, printing and paper leave nothing to be desired, and the book, judged as a whole, should take high rank in ornithological literature.

W. P. P.

PRACTICAL PHYSIOLOGY.

An Introduction to Physiology. By William Townsend Porter, M.D., Associate Professor of Physiology in the Harvard Medical School. Pp. xvi + 314. (Cambridge, Mass.: The University Press, 1901.)

THIS new text-book of practical physiology is interesting from two distinct points of view. It is the first important work on the subject which has appeared by an American author, and the faculty for the invention of simple yet efficient mechanical devices which is characteristic of Americans is here reflected in clearly written descriptions of inexpensive apparatus which will, in large part, be novel to the British physiologist, who has, unfortunately, grown up to believe that adequate instruction cannot be given in physiology without expensive and elaborate apparatus and laboratory fittings. But the book has other importance, in that it is an indication of the extent and nature of the teaching that can be given to the medical student under the new system of dealing with the purely scientific subjects of the medical curriculum which has recently been inaugurated at the Harvard Medical School.

The present is a most opportune time to consider any new schemes which have appeared in other lands for the teaching of these "preliminary and intermediate medical studies," as the new London University styles them, when there is so much vexation and anxiety of heart as to how concentration of teaching and saving of labour may be effected under some general scheme which will give the reconstituted University of London a medical

faculty in living reality, and not merely one which exists as a coherent body only in a printed list.

If one may judge by the extent of Prof. Porter's text-book, the Harvard student is taught a wider course of practical physiology than is attempted to be taught at any of our London medical schools, and, further, if he be taught the subject in the carefully inductive manner outlined by the author in his preface, he also obtains much more true scientific training in addition to this more extensive course. The latter point is the more important of the two, for, as Prof. Porter truly puts it in his preface, "the student should be trained rather than informed," for "the trained observer can, and must, be trusted to inform himself."

This wider course is covered in a period of four months, while in this country the student of medicine spends two years over physiology. Things do go proverbially quick in America, but this is not the reason for the disparity in time; the explanation is that the Harvard man spends *all* his hours of study during those four months upon physiology, whereas in this country the medical student's time is spent in attempting to make an intimate mixture of physiology, anatomy, organic chemistry and therapeutics. At the end of the two years the result is that the British student has wasted much time in hopping about from one branch of the tree of knowledge to another, and has not spent a sufficient interval at any one sitting upon any particular branch to gain much real benefit from it. So that finally he neither knows much of the experimental facts of any one of the subjects, nor, which is of more importance still, has he gained any training in scientific method or been imbued with any of the modern spirit of scientific inquiry or research.

His weary brain has been enslaved at unpalatable task-work all the two years, grinding up, at the same time, all four of these important subjects so that he may make answer to stock questions upon them at examination time. He is not judged at all by his character as a student known to his teachers, for the good or bad work that he has turned out during that period, or for any talent or originality that he has shown. There is no attempt, nor is there time for any attempt, to allow him to show what subject he loves; indeed, the system is calculated to make him hate them all instead. He must simply grind and be ground to the same stereotyped pattern as all his fellows; he must, in short, read and struggle to pass his Inter. M.B. Ask any of these men what he is doing at any part of the period and you will hear, not that he is studying anatomy or physiology or any of the other subjects, but that he is going up for his "Inter." at such and such a date; the dominant idea is the woeful examination and how best to get through it, and not any attraction for, or interest in, his subjects of study.

For the continuance of this condition of things the teachers, and not the students, are responsible. When we introduce a rational system of studying these subjects, which will teach our students to think, to examine critically the work done by others who have gone before them and to make attempts to proceed farther by themselves, a new era will dawn in which students will take an interest in their work and will rejoice in knowing that

they will be judged on what they have been doing throughout their course, and not upon the extent to which they have impaired their memories and intellects by merely memorising the opinions of other men from their text-books and lectures.

Contrasted with the scientific progress of our time, the maintenance of our present system of examinations, and the perversion of the work of our costly laboratories into mere preparation for them, instead of teaching these subjects as a training in scientific observation and research, may truly be described as conservatism run to seed.

If it be granted that our main object ought to be, during these earlier years, to give the student a training in the methods of scientific investigation in the broad field of biology, and not to cram his mind with experimental facts gathered from the text-book or lecture-room, then the system introduced at Harvard of studying one subject thoroughly at a time and, when this has been mastered, from the point of view expressed above, passing on to the next, is undoubtedly a move in the proper direction. This is more especially true in the case of the branches of biological study where a knowledge of one subject is required before another can be advantageously taken up; where there is, so to speak, a definite *natural* order in which the subjects should be taken up. The writer's one experience under our present system, to give an example, is that the first two months or more of attendance on lectures in physiology are absolutely wasted, because the student begins his study of anatomy at the same time as physiology; if he completely finished his anatomy before he came to physiology, and then had all his time for physiology, our task would be much lighter, nor would the student be handicapped at all in his study of anatomy by not having learnt his physiology. Again, he ought to have completed a course on cellular physiology and done all his minute anatomy or histology, including his practical work in histology, before he commences to study the physiology of the mammal.

Further, what advantage accrues from studying a number of subjects at the same time? The student cannot possibly become absorbed in one and grow to enjoy really the study of it, because he feels that his other subjects are becoming cold from neglect. He must, therefore, turn about from one to another, and surely no scientific progress can be made by reading in such a scrappy fashion. The person who can do it with conspicuous success is certainly not the kind of person we want to encourage; yet for such intellectual weeds we arrange a system which chokes out, or does the best that can be imagined to choke out, our choicest flowers. This furnishes a sufficient clue to the well-known observation that our men of highest genius in the past have often been those that the schools rejected, or found no occasion to honour.

The conscientious student who starts simultaneously the study of anatomy, physiology, organic chemistry and materia medica under our present system is surely to be pitied. He hears a lecture in anatomy and tries to take some interest in this; he passes on to one, say, in organic chemistry, and for the time switches his attention off anatomy on to organic chemistry; next he turns his mind to physiology, and finally, weary and baffled, he probably

sleeps through a lecture on the preparations of morphia of the British Pharmacopœia. Such intellectual juggling gives the student an acquaintance with the jargon of science, but of scientific method and scientific spirit it most assuredly teaches him nothing.

Every text-book of practical physiology must necessarily be written primarily to suit the requirements of a particular laboratory and a particular teacher, since the types of instrument used in different laboratories vary much, and the selection of experiments chosen by different teachers is also a very variable quantity. Prof. Porter's book has been written to suit the requirements of the Harvard course, and a number of the instruments described have been devised by himself for that course and with a special view of combining economy with efficiency. In nearly all cases, however, the experiments described can easily be adapted to the forms of apparatus used in this country, and the directions are clear and easily followed.

The large number of simple sketches showing the student how to arrange his apparatus is a novel and important feature of the book. This is a great improvement on the usual photographs of apparatus seen in most text-books of practical physiology hitherto published, which are of no service, because the student sees the apparatus on the laboratory table before him, and on the reproductions of tracings, which have little value, since the student obtains copies for himself in the course of his work. In all cases in this book the illustrations are designed to aid the student in understanding what he is asked to do, and are not intended merely for ornament, although they are, at the same time, well drawn and reproduced.

The book is divided into two parts, of which the first treats of the physiology of nerve and muscle, and the second of the circulation of the blood. The first section is much the longer of the two, and includes many experiments which are not usually attempted in this country by the student, but are nevertheless well within his power and very instructive; as examples of this may be cited, the stimulation of involuntary muscle, polar stimulation of the heart, galvanotropism, the effect of calcium salts upon skeletal muscle, idiomuscular contraction, summation of inadequate stimuli, and the stroboscopic method of demonstrating the action current of tetanus. The second section, although shorter, also contains several experiments hitherto novel to the usual student's course.

On the whole, it may be said that the book is clearly written in an original style, and is a welcome departure from the hackneyed treatment of practical physiology which is usually presented to the student.

BENJAMIN MOORE.

AN AMERICAN INTRODUCTION TO BOTANY.

Plant Studies. An Elementary Botany. By John M. Coulter, A.M., Ph.D., Head of Department of Botany, University of Chicago. Pp. vii+392. (London: Henry Kimpton, 1901.) Price 7s. 6d. net.

DR. COULTER'S work is one of the kind now in fashion, as it is a text-book for beginners that deals argely with the bionomics or œcology of plants. The

study of œcology is, beyond doubt, of value to beginners in that it immediately establishes a sympathetic interest in the plant as a living organism, which has wants to satisfy, a policy to pursue and warfare to wage. Yet a scientific survey of a plant's life in relation to environment is, in most respects, possible only after a thorough investigation into the physiology and structure of many plants; in other words, an œcological truth is rarely susceptible of brief and simple proof. Consequently, in placing this branch of the subject before the student at the outset of his studies there is always a danger of cramming the beginner with principles of which no adequate proofs are given, or indeed possible at that stage. In a work of small size like the one before us it was impossible for the author to give proofs of more than a few principles, and he has elected to lay stress rather upon the illustration of principles than upon their accurate demonstration. The work is therefore hardly adapted to serve as an introduction to scientific botany for the use of students working without a teacher's aid; nor does Dr. Coulter intend that it should so serve; he states definitely that the book is intended to supplement the teacher, the laboratory and field-work.

The first 220 pages are concerned in the consideration of the general œcology of plants and of special "societies" (hydrophytes, mesophytes and xerophytes). Though the views expressed are for the most part those to be found in the works of Kerner, Warming and Schimper, there are not wanting cases in which the author enunciates views that are unwarranted; for instance, very dubious in relation to the protection of flowers is the significance of the water reservoirs of the teasel and of *Bilbergia* (p. 136). Lacking in proof, too, is the statement, "In certain parts of the tropics the air is so moist that it is possible for some plants to obtain sufficient moisture from this source, without any soil-relation or water-relation" (p. 98). On p. 123 the term cross-pollination is made to include geitonogamy despite of the different physiological effects of the two processes.

While arousing interest and stimulating a certain kind of intelligent observation, the book hardly encourages close reasoning or accurate language. It is ever a question as to when the rigid precision of technical terms may give place to vague elasticity of more familiar language. And in this respect the author can hardly be congratulated. Such expressions as "earth influence" (in relation to geotropism), "light influence" (in relation to heliotropism), "soil roots," "water roots," "air roots," "soil-related," "leaf-related," "light-relation," "life-relation," "life-process," "seed plants," though strongly reminiscent of the Fatherland, hardly seem to be improvements either on ordinary English or on appropriate technical expressions. At times, indeed, it is not easy to grasp the meaning of some of the sentences; for instance, after telling us that a root "is either an absorbent organ or a holdfast, or very often both," the author continues, "For such work no light-relation is necessary, as in the case of foliage leaves; and there is no leaf-relation, as in the case of stems" (p. 89).

The latter half of the book briefly considers selected groups of cryptogams, and gives an outline of the general characters of "flowering plants," which last Dr. Coulter terms "spermatophytes."